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Information brief

The wildlife–livelihoods–health nexus: challenges and priorities in Asia and the Pacific

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Executive summary

The interplay between infectious diseases and wildlife, people and their livelihoods has always been an intrinsic part of human existence. Until recently, however, this nexus has been minimally considered in research and policy. The need for change is increasingly recognized following the emergence of zoonotic diseases such as severe acute respiratory syndrome (SARS), avian influenza, Nipah virus and severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) – the cause of the global COVID-19 pandemic. Despite the threats to health, economies and societies that these interactions have produced, wildlife remains essential to the livelihoods of countless rural communities, particularly those of Indigenous Peoples. There is an urgent need for action to mitigate or prevent future calamities and promote sustainable coexistence between people and wildlife.

This first information brief on the wildlife[1]–livelihoods[2]–health nexus in Asia and the Pacific is intended to shed light on the current landscape of human–wildlife–health interactions, examine the challenges, and the existing and potential opportunities for change. The brief concludes with recommendations for policymakers on how to better protect all species, livelihoods and societies. The recommendations are expected to stimulate coordinated actions and promote policy changes and investments across sustainable use and management of wildlife resources, rural livelihoods, and One Health.[3]

The recommendations in this brief target government authorities responsible for managing natural resources (including forests, wildlife and protected areas), rural development and One Health at national, regional, and local levels. They also target the donor community, the private sector, academia, non-governmental organizations (NGOs) and civil society, including formal and informal organizations representing Indigenous Peoples.[4]

This brief was produced through an extensive consultative process involving an interdisciplinary group of over 120 scientific, technical and policy experts from the Food and Agriculture Organization of the United Nations (FAO), the Collaborative Partnership on Sustainable Wildlife Management (CPW), research institutions, universities, intergovernmental organizations (IGOs), NGOs and individuals.

1 In this brief the term **wildlife** includes wild mammals, birds, reptiles, amphibians, fish and invertebrates as well as plants, fungi and algae. These include populations of any wild species that have not been domesticated through multigenerational selection for particular traits, and which can survive independently of human intervention that may occur in any environment. In other words, all uncultivated flora and non-domesticated fauna.

2 A **livelihood** encompasses the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (Chambers & Conway, 1991).

3 **One Health** is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems. It recognizes that the health of humans, domestic and wild animals, plants and the wider environment are intricately linked and interdependent (FAO, OIE, WHO and UNEP, One Health High Level Expert Panel, 2021).

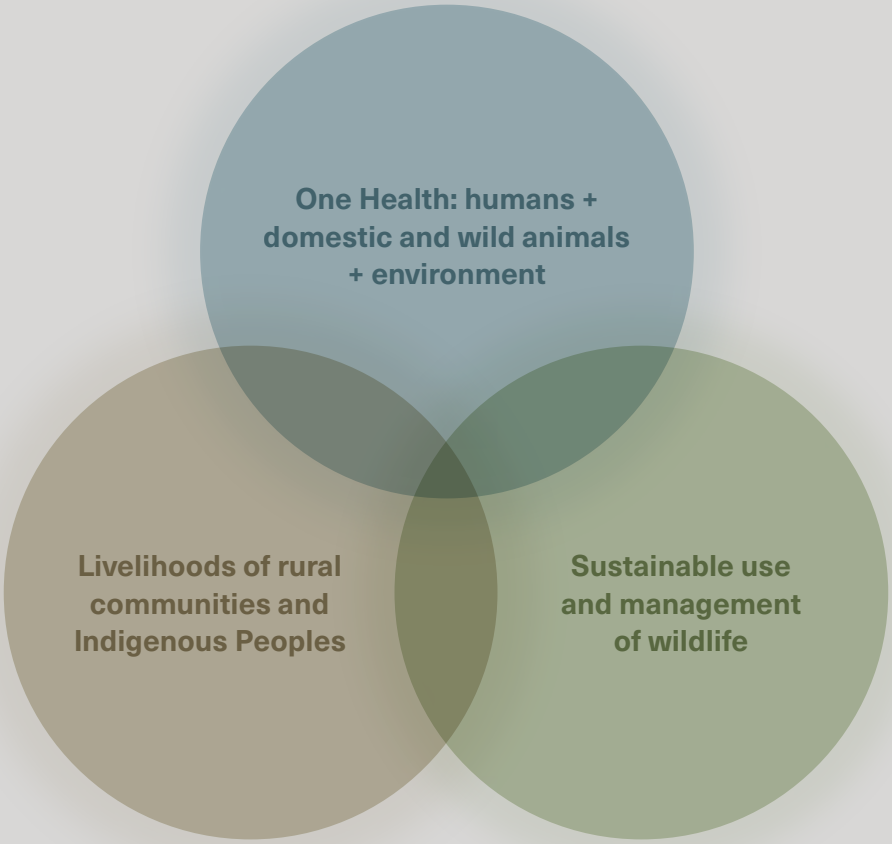
4 **Indigenous Peoples** were not systematically consulted with in the elaboration of this brief. Full consultation and engagement with these communities are needed before acting on the recommendations in this brief at the local and national levels. Further work on refining policy and practice recommendations and solutions across the wildlife–livelihoods–health nexus would benefit from and require an inclusive participation process with Indigenous Peoples.

Context

The wildlife–livelihoods–health nexus in Asia and the Pacific is at a crucial juncture requiring immediate attention and action (Figure 1). The need to accelerate momentum towards more sustainable, efficient, resilient and inclusive wildlife-based food systems and related challenges, including the recovery from the COVID-19 pandemic, is clear. The pace of change in the region has accelerated with populations expanding and urbanizing, economies growing and pressure on natural resources increasing. As humanity struggles to deal effectively with the worsening climate crisis and biodiversity loss, successive COVID-19 waves, regional conflicts and widening inequalities, it has become increasingly evident that many interconnected challenges threaten the livelihoods and well-being of rural communities and Indigenous Peoples.

Figure 1.

The relationships at the wildlife–livelihoods–health nexus


One Health: humans + domestic and wild animals + environment
Livelihoods of rural communities and Indigenous Peoples
Sustainable use and management of wildlife

Many wildlife species are harvested unsustainably and unsafely in Asia and the Pacific (Lee *et al.*, 2014). As countries recover from the consequences of the COVID-19 pandemic, the challenge remains to sustainably use and manage wildlife to meet the livelihood needs of rural communities and Indigenous Peoples, while concomitantly minimizing the risks of zoonotic disease emergence (FAO *et al.*, 2020; FAO *et al.*, 2021). These factors combine with other threats to the livelihoods of rural communities and Indigenous Peoples, including unsecure land tenure and unresolved rights to needed natural resources, further complicating efforts to restore ecosystems and support sustainable agrifood systems (FAO, 2022a).

Targeting the wildlife–livelihoods–health nexus will better enable rural communities and Indigenous Peoples address their challenges and take advantage of opportunities that arise at this important interface. These opportunities include ecosystem restoration and the sustainable management of wildlife in ways that minimize risks from zoonotic diseases based on multiple knowledge bases including those of traditional and Indigenous Peoples (FAO *et al.*, 2020; FAO *et al.*, 2021; Unuigbe, 2021). Furthermore, innovations and market opportunities, if appropriately enabled and equitably applied, will also help promote prosperity for rural communities and Indigenous Peoples along the wildlife value chains (FAO, 2022a; Ickowitz *et al.*, 2022; FAO, TRAFFIC & IUCN, 2022).

Addressing the emerging complexities in the region at the wildlife–livelihoods–health nexus is a challenging endeavour. Therefore, it is vital that work at this nexus is included in national efforts to secure equitable and sustainable futures in Asia and the Pacific and thus contribute to achieving the Sustainable Development Goals (SDGs). Additionally, the Kunming–Montreal Global Biodiversity Framework (KMGBF) provides a unique opportunity to strengthen work across this nexus, and further advance coordinated initiatives and policy-change processes at several tiers of governance. The KMGBF acknowledges the essential roles and contributions of Indigenous Peoples as custodians of biodiversity and as partners in the conservation, restoration and sustainable use of natural resources such as forests and wildlife. The KMGBF includes several targets of relevance including: incorporating rights of Indigenous Peoples in spatial planning (Target 1); area-based conservation (Target 3); ensuring sustainable, legal, safe use and benefits from wild species, including through customary use and reducing risks of pathogen spillover (Targets 5 and 9); fair and equitable sharing of traditional knowledge (Goal C, Targets 13 and 20); and participation and respect for the rights of Indigenous Peoples to lands, territories and resources (Target 22).

The key elements of the wildlife–livelihoods–health nexus are explored in more detail below.

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Wildlife —

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Asia and the Pacific's rich biodiversity and associated ecosystem services are vital for human well-being and for sustainable development. The biodiversity in the region is essential for providing food, water, energy, health security, and cultural and spiritual fulfilment to 4.5 billion people (IPBES, 2018). Moreover, it is home to vast wildlife diversity that supports food security, nutrition, health, cultural vitality, income generation, recreation and education for many rural communities and Indigenous Peoples (FAO, 2020; HLPE, 2017). A sizeable portion of the estimated 60 000 plant species used globally originate from the Asia and Pacific region, of which about 26 000 species have well-documented medicinal and related uses (e.g. cosmetics, aromatherapy, food and drink). These species underpin traditional medicine and other practices contributing to human well-being (FAO, TRAFFIC & IUCN, 2022). Further evidence of the importance of wildlife is that across 12 forest sites in Asia wild species contributed 20.1 percent of household income (Angelsen *et al.*, 2014; IPBES, 2022). Equally important, the region's wildlife plays a fundamental role in ecological processes including maintaining ecosystem services and ecosystem health, thereby making an essential contribution to planetary health.

Recent findings also show that populations of many wild mammals and birds have declined across the region (IPBES, 2022). Habitat degradation and fragmentation, especially in forests, wetlands and grasslands, have primarily resulted in declining wild mammal and bird populations. In addition, illegal trade in wildlife and wildlife products is causing species to decline in some countries (IPBES, 2018). As of July 2023, an online review of the IUCN's Red List indicated that of 50 318 plant, animal and fungi species whose statuses have been assessed in land regions of Asia and the Pacific, 14 681 (29 percent) were considered extinct, extinct in the wild, critically endangered, endangered or vulnerable (IUCN, 2022).

The frequency of human–wildlife conflicts (HWC) in the region is increasing as a consequence of deforestation, ecosystem fragmentation, livestock encroachment on wildlife habitats and other factors. HWC currently ranks among the major threats to the survival of many endangered species as well as for the security and well-being of many rural communities and Indigenous Peoples (FAO, 2021). This has become a major challenge in many countries in Asia and the Pacific, sometimes creating negative sentiments towards conservation efforts, especially when new protected areas are established or when existing protected areas are expanded.

The following aspects related to the wildlife dimension of the nexus have been identified:

- Systematic and robust data collection on harvested wildlife species is essential, including population status and trends, behavioural ecology, ecological functions, habitats, sustainability of use, legality of use, and potential in zoonotic disease transmission. This process should involve Indigenous Peoples and rural communities recognizing the value of traditional knowledge, acknowledging data sovereignty issues, and following free, prior and informed consent (FPIC) procedures.

- Data collection and regular monitoring of wildlife contributions to livelihoods, food security and health from subnational to regional levels is needed, including through the use of modules in FAO Forestry Paper 179 on national socioeconomic surveys in forestry. At present, this data gap has resulted in national policies that do not adequately consider the contributions of wildlife as part of sustainable and inclusive food systems.

- Greater attention is required for the conservation and population restoration of non-charismatic species, which are equally important to rural communities and Indigenous Peoples. These include various forest ungulates, large edible rodents, bats, and small animals that play key roles in pollination and seed dispersal, along with medicinal and food plants and fungi.

- Sustainable wildlife management (Box 1) requires a community-based approach including integrating traditional knowledge (Brondízio *et al.*, 2021).
- Strategies for developing alternative food sources for rural communities and Indigenous Peoples are needed to reduce pressure on wildlife populations (Kanagavel *et al.*, 2016). These strategies may include wildlife farming where appropriate, and when occupational health and well-being of the farmers and other stakeholders can be assured.
- Permanent blanket bans on wildlife use should be avoided as they often have unintended negative consequences for the livelihoods of millions of rural communities and Indigenous Peoples in the region. Furthermore, such bans can inadvertently increase the frequency and sophistication of illegal trade.

Box 1.

Six key points from the community-based Sustainable Wildlife Management Programme

1. Communities need to know the abundance of wildlife, including fish, in their environment, if these animal populations are stable or declining, and how they are currently used by the community.
2. Stewardship is predicated on the recognition and respect of communities' rights to their resources.
3. Empowered communities are the most appropriate level of organization for managing wildlife.
4. Working together is critical.
5. Communities need recognized governance groups.
6. Producing alternative sources of food and income.

- Behavioural change strategies should be developed for urban and peri-urban dwellers, who are key consumers, yet do not depend on wildlife for subsistence. These should include strengthening national education curricula from primary schools and upwards to reach the coming generations. These strategies should aim to reduce zoonotic disease risks from wildlife, while improving prospects for biodiversity conservation and promoting "green" products from landscapes that are harvested sustainably with equitable sharing of benefits.
- Governance frameworks need to be strengthened. These frameworks should take into consideration that the designations of *authority over wildlife* (including tenure, access and use rights) often varies across and within countries and are often split between ministries with responsibilities for animals, fish, plants or habitats. These frameworks should be strengthened to better recognize customary law, norms and organizations of rural communities and Indigenous Peoples.
- Improved international cooperation is crucial to more effectively reduce trafficking, corruption and porous borders to minimize the unregulated, illegal and unsustainable trade in wildlife. This trade can heighten risks of zoonotic disease spread and lead to other negative impacts including biodiversity decline.
- Successful management of human–wildlife conflict requires an interdisciplinary set of approaches and an in-depth understanding of the social, economic, political and cultural root causes of the conflicts. Approaches must consider the cultural values, knowledge systems and practices, resource needs, territorial and resource rights, and governance systems of Indigenous Peoples and other relevant communities affected (FAO, 2021).

Livelihoods —

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As of 2012, approximately 1.6 billion people in the world were living within 5 km of a forest, with 64.5 percent of them in tropical countries (Newton *et al.*, 2020). This includes millions of Indigenous Peoples and rural communities in Asia and the Pacific. Indigenous Peoples constitute over 6 percent of the global population (World Bank, 2023) and are spread across the seven sociocultural regions of the world. Of these, an estimated 335.8 million Indigenous Peoples live in Asia and the Pacific, comprising 70 percent of Indigenous Peoples worldwide. Of all Indigenous Peoples in the region, 72.8 percent live in rural areas (ILO, 2019). As much as 80 percent of forest biodiversity lies within Indigenous Peoples' lands, and 22 percent of the forest carbon found in 52 tropical and subtropical countries is stewarded by rural communities, with one-third of those located in areas where Indigenous Peoples and local communities lack formal recognition of their tenure rights (Frechette *et al.*, 2018). These communities hold a wealth of traditional knowledge on zoonotic diseases, agrifood systems and the sustainable use, conservation and restoration of wildlife (Unuigbe, 2021). They have deep connections to their territories and their biodiversity, have developed profound knowledge on seasonal and ecological cycles, and have learned to gather food, medicine, energy and shelter through agriculture, agroforestry, fisheries and livestock husbandry (Table 1). Moreover, these territories and ecosystems are a central part of the cosmovision, identity and culture of Indigenous Peoples.

Table 1.

Contributions of wildlife to the lives and livelihoods of Indigenous Peoples, other rural communities, and broader society in Asia and the Pacific

Organism types	Harvesting and usage practices	Direct wildlife resource use	Broader local, national and international uses
Large mammals	Hunting (guns, traps, snares, nets)	Daily food needs: carbohydrates, proteins, fats, vitamins, minerals, fibre, water	Food: low cost to "exotic" high value
Small mammals: bats, rodents, etc.	Gathering	High-value nutrition for vulnerable life-stages: pregnancy, first 1 000 days of life, ill-health	Fodder
Birds	Logging	Medicines and aromatics	Medicine: traditional and western
Reptiles and amphibians	Fishing (nets, traps)	Fodder	Aromatic and hygiene products
Fish	Semi-wild cultivation and husbandry (including shifting cultivation)	Fuel: cooking, heating, lighting	Construction materials
Insects: edible species, honey producers	Non-extractive uses	Shelter construction	Energy
Trees		Apparel: fibre, skins, dyes	Artifacts for ceremonial, ritual and spiritual uses
Other plants, fungi, algae		Household items, tools, etc.	Decorative aesthetic products
		Spiritual and cultural artifacts	Pets and ornamental plants
		Recreation, health, education	Learning and education
		Cash generation and barter for outside goods and services	Recreation, cultural and health services
		Safety nets for risks and shocks: environmental, health, economic and political	

Source: IPBES. 2022. *Summary for policymakers of the thematic assessment of the sustainable use of wild species of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Germany. https://doi.org/10.5281/zenodo.642559

The socioeconomic and demographic situations of many rural communities, including in forested landscapes in the region, are characterized by extreme poverty levels and a rise in migration to urban areas, particularly by the younger generation (Miller *et al.*, 2020). Furthermore, forest resources can provide critical safety nets for such communities during natural disasters, economic downturns, periods of unrest, commodity-food crises and pandemics. Escalating HWCs are a particularly grave social and livelihoods challenge for rural communities and Indigenous Peoples, as well as a serious threat to the survival of wildlife itself (FAO, 2021).

According to an International Labour Organization (ILO) report, more than 86 percent of Indigenous Peoples globally, and many in Asia and the Pacific, work in the informal economy (ILO, 2019). They often lack access to government services such as health, education and social protection. Levels of formal education for these communities are often low, particularly for women.

The following aspects relating to the livelihoods of rural communities and Indigenous Peoples should be emphasized:

- In-depth information on the use of wildlife resources by rural communities and Indigenous Peoples to support food systems, health systems and economies remains limited and is not always up-to date. The IPBES Assessment Report on the Sustainable Use of Wild Species and the IPBES Diverse Values and Valuation guidance for nature provide an important initial step to cover this information gap (IPBES, 2022).

- Currently, there is no global dataset that comprehensively maps the extent of lands under the custodianship of rural communities and Indigenous Peoples. Participatory mapping is critical to ensuring that lands under their governance can be documented, regardless of their legal status. The ICCA registry and database,[5] which is an online information platform for territories and areas conserved by Indigenous Peoples and local communities, represents a commendable step towards achieving this goal. There needs to be an adequate level of respect, recognition and formalization of the collective and customary tenure rights of rural communities and Indigenous Peoples over the lands and natural resources, including wildlife, that they have traditionally owned or governed (Box 2).

Box 2.

FAO 2022 **Voluntary Guidelines on the Responsible Governance of Tenure (VGGT)** serve as a reference and guide to improve the governance of tenure of land, fisheries and forests with the overarching goal of achieving food security for all and to support the progressive realization of the right to adequate food in the context of national food security.

- In cases when the rights of rural communities and Indigenous Peoples to their lands and territories are recognized, more support is needed for registration and titling, and proactive advocacy to help shape an enabling legal and policy environment (Artelle *et al.*, 2019; WWF *et al.*, 2021).

- Development agendas such as agricultural expansion, urbanization and industrial projects are not yet fully incorporating and regularly obtaining FPIC from Indigenous Peoples and other rural communities.

[5] https://www.iccaregistry.org/

This needs to be the standard practice.

- Knowledge sharing and capacity building in multiple languages, including indigenous languages, as well as culturally appropriate methodologies are needed to address shortfalls to increase capacity for securing native people-led natural resource governance and management (WWF *et al.*, 2021).
- Financial support and capacity-building opportunities for Indigenous Peoples are not sufficient nor sustainable. At present, robust mechanisms to facilitate availability and access to financial resources and technical support to native peoples are not sufficiently available nor operational.

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Health —

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In the context of human health, the interfaces between animals, humans and the environment are critical, considering that around 60 percent of all emerging human infectious diseases have a zoonotic origin (Woolhouse and Gowtage-Sequieria, 2005). In other words, they were originally present in animals and were then transmitted to humans. Of recent zoonotic emerging infectious disease (EID) events, almost three quarters (71.8 percent) were caused by pathogens that originated in wildlife (Jones *et al.*, 2008).

Wildlife species of special concern for zoonoses include bats, rodents, primates, small carnivores and some birds given their roles as hosts of viruses and other pathogens. However, other species can also function as intermediary vectors or as origins for EIDs. Wild meat from many of these species is an important and traditional source of protein, fat and micronutrients for millions of Indigenous Peoples and rural communities, particularly in tropical and subtropical regions (Box 3). Various unsanitary practices at human–animal interfaces (farms, intermediary holding, transport, markets, and slaughter and butchery sites) may contribute to increased risks. The intensified human–animal contact through unregulated trade in wildlife, especially in large urban areas, increases the risk of zoonotic disease transmission (Engel and Ziegler, 2020). Furthermore, the sale and use of certain live wildlife species in traditional food markets pose an elevated risk.

Box 3.

The Collaborative Partnership on Sustainable Wildlife Management's guiding principles to reduce risks from zoonotic diseases

1. Recognize the importance of the use of wildlife for many communities, including Indigenous Peoples and Local Communities in policy responses.
2. Maintain and restore healthy and resilient ecosystems to reduce risks of zoonotic spillovers and future pandemics.
3. Regulate, manage, and monitor the harvesting, trade and use of wildlife to ensure it is safe, sustainable and legal.
4. Understand that wildlife persecution, including killing of wild animals suspected of transmitting diseases, will not address the causes of the emergence or spread of zoonoses.

When wild animals are kept in cages, and slaughtered and dressed in open market areas, these areas become contaminated with body fluids, faeces and other waste, increasing the risk of transmission of pathogens to workers and customers and potentially resulting in spillover of pathogens to other animals in the market (WOAH, WHO and UNEP, 2021). In addition to markets, there are a number of practices at human–animal interfaces, such as on wildlife and other animal farms, as well as at slaughter and processing sites that may increase the risks of disease transmission (World Bank and FAO, 2022).

The spread of infectious pathogens of pandemic potential has been occurring more frequently in Asia and the Pacific, and the region has been identified as a global hotspot for EIDs, including zoonoses. These include those that cause diseases such as SARS, Nipah, COVID-19 in humans, and epidemics in animals, such as HPIV, or highly pathogenic influenza viruses (Allen *et al.*, 2017; World Bank and FAO 2022a). Recent studies in the region highlight several wildlife species as potential drivers of pathogen emergence (He *et al.*, 2022; Nga *et al.*, 2021).

The causal factors for the emergence of infectious diseases with wildlife in the region include land-use changes (from deforestation, fragmentation, and degradation to afforestation), increased HWCs, national and international trade in wildlife products, unsanitary wildlife farming practices, pathogen adaptation

(FAO, 2022b; Dobson, *et al.*, 2020; Ribeiro *et al.*, 2022) and failures in laboratory biosecurity. Land-use change is recognized as a major driver of disease emergence, associated with approximately one-third of recent disease emergence events (Loh *et al.*, 2015; FAO, 2022). Wide-scale land conversion and encroachment on wildlife habitats are altering biodiversity and ecosystems in the region in unprecedented ways. For instance, Southeast Asia lost an annual average of 1.6 million hectares of forest between 1990 and 2010 (Stibig *et al.*, 2014), largely due to agricultural expansion and the harvesting of forest goods. Growing demand for wildlife products is driven by urban, wealthier populations willing to pay a high price for them as luxury products. Moreover, expanding livestock and other agricultural activities near forested areas or other wildlife habitats, as well as the introduction of poultry production along wild bird flyways, creates opportunities for the spillover of diseases, often in conditions favouring the spread of the pathogen (World Bank and FAO, 2022). The association between ecosystem changes and EIDs demonstrates the need to improve prevention and detection measures and bolster response actions that consider all aspects of the animal–human–environment interface, preferably using the One Health approach.

Many concerns relating to reducing risks of EIDs and the dynamics of their spread exist in the region, namely:

- Harvested wildlife species of particular concern as pathogen hosts and vectors need to be adequately understood and documented along with their spatial distributions.
- The use and effectiveness of traditional knowledge-based and Indigenous Peoples' practices to avoid or treat wildlife-associated infectious diseases are not sufficiently appreciated nor documented, despite being in use for millennia in some cases. Furthermore, mainstream science-based strategies for reducing EID risks from wildlife, particularly in regard to those species harvested by rural communities in forested landscapes, often inadequately incorporate the invaluable traditional and Indigenous Peoples' knowledge as well as the methods they employ to reduce risks in livestock management.
- Engaging rural communities, Indigenous Peoples and others residing in forested and other landscapes with tools and approaches for pathogen detection, monitoring and surveillance has not been established at scale.
- Insufficient strategies are available or implemented to reduce spillover risks along the value chains for wildlife products. An example would be improving sanitary and hygienic practices during processing by rural communities and Indigenous Peoples in forested landscapes at or close to the harvest point.
- There are no interdisciplinary One Health strategies that fully incorporate the needs of Indigenous Peoples and that could be readily used by these communities (Riley *et al.*, 2021). These must consider the public health issues from food and nutrition insecurity caused by various new measures, such as bans on some food products involved in EID outbreaks.
- Significant concerns exist about wildlife and its role as a reservoir for pathogens that cause EIDs. Wildlife can transmit endemic, novel and often little understood zoonotic diseases to people. At the same time, humans and livestock can transmit diseases to wildlife, with negative effects on wild populations including those of endangered species. Wild meat can be a source of non-zoonotic foodborne disease, and wildlife can contaminate human water sources. However, there are other important relationships between wildlife and human health. For example, consumption of wildlife products can improve food and nutrition security, and wildlife can be a source of Indigenous Peoples' medicines and nutraceuticals.

- Effective and well-implemented social and behaviour change communication strategies are weak or lacking to address the adverse impacts on ecosystems, and wildlife and human health related to consumption of wildlife-associated products. A number of core behavioural science concepts exist that could provide critical points of reference for creating messages and approaches to raise awareness and change consumer choices (TRAFFIC, 2016).

FAO's work of relevance

In line with the 2030 Agenda for Sustainable Development, FAO's Strategic Framework 2022–31 supports the transformation to more efficient, inclusive, resilient and sustainable agrifood systems for better production, better nutrition, better environment and better life, leaving no one behind. FAO is addressing the wildlife–livelihoods–health nexus in several Programme Priority Areas implemented under the "*four betters*" to contribute to the achievement of specific SDGs, such as SDG1 (No poverty), SDG2 (Zero hunger), SDG3 (Good health and well-being) and SDG15 (Life on land).

FAO provides technical advice and supports the implementation of various international processes and frameworks related to this nexus. These include the Global Forest Goals of the UN Forum on Forests (UNFF), the UN Convention on Biological Diversity (CBD) and its recently adopted KMGBF, several UN Food System Summit outputs and other international agreements.

FAO's key initiatives and programmes at the wildlife-livelihoods-health nexus include:

- The Sustainable Wildlife Management Programme (SWM Programme) is an EU-funded initiative of the Organisation of African, Caribbean and Pacific States (OACPS) involving a consortium of four multidisciplinary technical partners: FAO, CIRAD, CIFOR and WCS. Since 2017, the SWM Programme has been developing and testing innovative models to address wild meat and food security issues including for mainstreaming the One Health approach. Currently implemented in 15 OACPS countries, the SWM Programme has been extended to Asia since August 2023.
- The Collaborative Partnership on Sustainable Wildlife Management (CPW), the secretariat of which is hosted by FAO, provides a platform for addressing wildlife management issues that require national and supra-national responses, and works to increase cooperation among its 13 international partners[6] and external stakeholders.
- The Forest and Farm Facility (FFF) is a ten-year-old partnership between FAO, IIED, IUCN and Agricord that seeks to strengthen and empower rural-producer organizations, including women, youth and Indigenous Peoples as primary change agents for climate resilient landscapes and improved livelihoods.

[6] The member organizations of CPW are: Secretariat of the Convention on Biological Diversity (CBD), Center for International Forestry Research (CIFOR), Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Secretariat of the Convention on Migratory Species (CMS), Food and Agriculture Organization of the United Nations (FAO), International Council for Game and Wildlife Conservation (CIC), International Indigenous Forum on Biodiversity (IIFB), International Institute for Environment and Development (IIED), International Union for Conservation of Nature (IUCN), International Union of Forest Research Organizations (IUFRO), TRAFFIC, United Nations Environment Programme (UNEP), and the World Organisation for Animal Health (WOAH).

- The UN Decade on Family Farming 2019–2028 is a joint effort by FAO and the International Fund for Agricultural Development (IFAD) that presents FFF with significant opportunities to highlight the role of smallholder producers and offers support to help them transform the productivity of landscapes and natural resource systems.
- The UN Decade on Ecosystem Restoration 2021–2030, led by the United Nations Environment Programme (UNEP) and FAO, aims to halt the degradation of ecosystems and restore them to achieve global goals including enhancing livelihoods, countering climate change and stopping biodiversity collapse. The FAO Regional Office for Asia and the Pacific is developing a number of forest and landscape restoration programmes.
- An initiative on wild plants and forest foods is underway to (i) improve the food security and nutrition, health and livelihoods of local and global populations, particularly those that benefit directly from wild plant resources from forests, trees and their ecosystems; and (ii) contribute to the conservation of wild flora and associated ecosystems and services.
- FAO works with several partners to address health, people, animals, plants and the environment in the context of EIDs, in particular through the One Health Quadripartite, which includes FAO, UNEP, the World Health Organization (WHO) and the World Organization for Animal Health (WOAH). Equally important regional initiatives are the Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADs) and the Emergency Centre for Transboundary Animal Diseases (ECTAD).
- The Joint FAO/IAEA Centre works on reducing the risks from emerging and re-emerging zoonotic epidemics and pandemics through the Zoonotic Disease Integrated Action (ZODIAC) Programme that aims to bring together laboratories and experts to develop a platform for accelerated research and development in the area of early detection and surveillance of zoonotic diseases at their sources.

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Recommendations

FAO proposes the following recommendations containing specific actions to strengthen the linkages at the wildlife–livelihoods–health nexus, initiate coordinated actions, and promote policy changes and investments across agendas relating to sustainable use and management of wildlife resources, rural livelihoods and One Health:

1. Improve data collection, monitoring and statistics on wildlife and its contribution to rural economies, food security, nutrition and health.

Address the gaps and challenges that exist in knowledge and information about wildlife and interlinkages with livelihoods and health in the region. This will require investments to strengthen data collection and monitoring (such as using the Modules in the FAO Forestry Paper 179, and the participatory One Health Surveillance Tools, and others, see Box 4) as well as further analysis and generation of statistics. These include designing and implementing protocols and methodologies collaboratively to enable the pooling of data across different sectors and government agencies to increase data availability and better capture the multifaceted contributions of wildlife. In addition, there is a need to provide tools and capabilities for Indigenous Peoples and community organizations to collect and analyse data on wildlife issues that are important to them and that support informed decision-making. Also, community-based monitoring and surveillance systems of wildlife related-zoonotic diseases and phytopathogens should be integrated with the One Health country programmes. Global frameworks, such as the KMGBF, provide a unique opportunity to initiate more comprehensive national wildlife data collection and set up robust reporting and monitoring systems by linking with relevant databases.

Box 4.

See several existing monitoring systems such as FAO's Food Insecurity Experience Scale and the 50x2030 Initiative that could be expanded to more holistically include wildlife.

2. Facilitate the development and sharing of knowledge and solutions.

Indigenous Peoples' strong attachment and sense of belonging to land and traditional knowledge often remains a lost opportunity. Therefore, it is necessary to apply transdisciplinary approaches across the natural, social, health and political sciences, along with improved recognition, strengthening and integration of Indigenous Peoples' knowledge. Full engagement with Indigenous Peoples in ways that respect their data sovereignty and FPIC in national processes is needed. This must involve inclusive consultation and partnership building. Several initial strategies and solutions are suggested below to strengthen connections with Indigenous Peoples' knowledge and practices:

- Develop and promote specific solutions for sustainable customary use of wildlife, including integrating usage practices based on Indigenous Peoples' knowledge, which reduce risks from pathogens (zoonotic, but also phytopathogens) in degraded and fragmented forests and landscapes.
- Design specific activities together with rural communities and Indigenous Peoples that support the restoration of wildlife species' populations, including through habitat restoration, of current and potential importance for sustainable food systems.

- Evaluate and support alternative uses of wild animals, fungi and plants as appropriate, such as through wildlife farming with improved husbandry practices and hygiene standards, that also increase involvement of rural communities and Indigenous Peoples.
- Develop guidelines for risk assessment of the impact of forest loss and degradation on infectious pathogen spread, the role of ecosystem health in mitigating pathogen spread and for disease regulation, and the consequences of reduced contributions of wildlife to the livelihoods of rural communities and Indigenous Peoples.
- Promote initiatives that will raise awareness and modify behaviours of wildlife-dependent communities and the wider public (especially urban and peri-urban consumers) to reduce unsustainable harvesting of wildlife species, in particular species of high zoonotic disease risk.
- Together with the affected communities, design and implement strategies on human–wildlife conflict prevention and mitigation, and that promote coexistence between people and wildlife.
- Develop specific training modules on the wildlife–livelihoods–health nexus and make them available through existing e-learning platforms and other extension training programmes aimed at the target audiences.

3. Create enabling conditions for wildlife, rural communities and Indigenous Peoples for sustainable coexistence.

This recommendation contains interconnected elements to create favourable conditions for rural communities and Indigenous Peoples, and for wildlife, namely:

- **Create biodiversity or wildlife corridors.** This will enhance connectivity between protected areas and across landscapes and will promote conservation of wildlife species and healthy ecosystems. However, this must be done in ways that also consider the risks of pathogen spread. Well-governed, effectively managed and representative protected areas and other effective area-based conservation measures (OECMs) are a proven method for safeguarding both habitats and populations of wildlife species and for delivering important ecosystem services and multiple benefits to people (KMGBF Target 3).
- **Improve Indigenous Peoples and community land-tenure systems and resource rights to facilitate opportunities for sustainable development.** FAO has developed various tools, such as the Voluntary Guidelines on the Responsible Governance of Tenure (VGGT), to advance this agenda. These tools have already been used in several Asia and Pacific countries. If fully executed, the VGGT provides guidance for action at a national level to resolve tenure and resource rights, which will benefit the rural communities and Indigenous Peoples as well as contribute to improving ecosystem health (FAO, 2019a; FAO, 2019b).
- **Activate community-based forestry as a driving force in boosting sustainability, livelihoods and resilience of rural communities and Indigenous Peoples.** FAO has developed various tools and normative products to assist countries, including a well-tested methodology to assess the extent and effectiveness of community-based forestry that is available for application at the national level (FAO, 2019b).
- **Build the capabilities of rural communities and Indigenous Peoples.** For more than 30 years, FAO's Farmer Field Schools have helped rural communities, including Indigenous Peoples and smallholders,

innovate and build technical, production, marketing, organizational and social skills on a wide array of agriculture and ecosystem-related topics through participatory knowledge exchanges. The **Forest and Farm Facility**, highlighted in the previous section, provides many training materials to support positive changes at the wildlife–livelihoods–health nexus. Also, a range of voluntary standards and tools from multiple stakeholder groups exists to support the implementation of good practices. It is further important to organize environmental sensitization workshops and campaigns in rural areas for local communities and in schools for communities to better understand the key role that wildlife plays in their surrounding ecosystems. Health-related issues caused by zoonotic diseases are an opportunity that cannot be underestimated to discourage communities from unsafe and unsustainable consumption of wild meat. Furthermore, it will be important to strengthen the capacities, recognition and roles of formal and traditional organizations of Indigenous Peoples and other local communities to support this work long term. Any process of capacity building with Indigenous Peoples must be based on the principle of co-creation and a full understanding of the needs of Indigenous Peoples.

4. Foster effective intersectoral coordination at the national and regional levels.

Intersectoral coordination is viewed as essential for advancing issues at the wildlife–livelihoods–health nexus at the national and regional levels. This can be further complemented by multistakeholder collaboration across all spheres including civil society, the private sector and governments.

- **National level:** Most governments are organized administratively within a framework of sector-based ministries and agencies with resource allocations and accountability managed vertically. This arrangement, to a degree, hinders actions that require working across sectors, such as forestry, wildlife, livestock, agriculture, finance and health, to name a few. To this end, it is paramount to establish high-level interministerial working groups or task forces with clearly articulated roles and coordination mechanisms to ensure effective communication across the nexus. The scope of existing coordination mechanisms, such as One Health country platforms, could be broadened to include all relevant aspects of this nexus.
- **Regional level:** Moving towards regional collaboration does not mean starting with a blank slate, but instead building on and nurturing existing international partnerships in the area of food security and nutrition, health, and the environment. This should be done with regional organizations such as the Association of Southeast Asian Nations (ASEAN) and the South Asian Association for Regional Cooperation (SAARC), the research community, representatives of Indigenous Peoples and apex Forest and Farm Producer Organizations (FFPOs).

Integrating the wildlife–livelihoods–health nexus in relevant ongoing and planned programmes, initiatives (e.g., Forest and Landscape Restoration, Biodiversity Mainstreaming, SWM Programme in Asia) and projects at national and regional levels is crucial for successful agrifood system transformation that will benefit wildlife-dependant people. A concerted and multisectoral approach is needed that respects and protects the natural resource access and use rights of Indigenous Peoples in Asia and the Pacific. The approach must also ensure they have access to the technical and financial resources they need to strengthen their livelihoods. Such an effort is the right step forward to increase their food and income security, conserve biodiversity, and reduce the risk of future zoonotic pathogens with the potential to trigger human pandemics.

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